

## MESENTERIC CYSTS.<sup>1</sup>

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THE word mesenteric has often been used in describing cysts within the mesentery, mesoceleon, mesorectum, or omentum; and there is an advantage in this use, since these regions, as well as the cysts which they contain, are anatomically similar. Even cysts which were almost entirely retroperitoneal have been called mesenteric.

In the seventeenth and eighteenth centuries a few mesenteric cysts were described. By 1803 enough cases had been recorded so that Portal<sup>1</sup> classified them. In 1886 Augagneur<sup>2</sup> found that eighteen out of ninety cases of tumors of the mesentery were cystic. In 1887 Hahn<sup>3</sup> gave a *résumé* of the subject and classified them as blood cysts, chylous cysts, serous cysts, and the echinococcus cysts. Arekion,<sup>4</sup> in his Paris thesis of 1891, gave reference to eighty-one reported cases. In 1892 Braquehaye<sup>5</sup> added twenty-three to this number, making 104. In 1897 Moynihan<sup>6</sup> contributed a most comprehensive article in the *ANNALS OF SURGERY*, in which he referred to previous articles and reported nine additional cases. The references given at the end of this article (Nos. 7 to 26) record thirty-two additional cases. This makes a total of 145 cases to which references are here given. Many of these cases, however, are not reported sufficiently in detail to make them really intelligible. The only record is often a statement made by a surgeon in a society meeting, or elsewhere, that he had found a cyst in

<sup>1</sup> Read in part before the New York Surgical Society, December 27, 1899.

the mesentery: the character of the fluid and the difficulties of operation or treatment were referred to; but there are comparatively few reports of the microscopical examination of the cyst wall and the chemical and microscopical examination of the cyst fluid according to the present methods. Such reports are being made more commonly now, and will, without doubt, lead to a better understanding of the subject.

Braquchayc's classification is as follows:

- (1) Sanguineous cysts, or haematomas, including certain serous cysts.
- (2) Lymphatic cysts, including the chylous cyst of authors, and most of the serous cysts.
- (3) Parasitic cysts, hydatids.
- (4) Congenital cysts, or dermoids.
- (5) Cysts of adjoining organs (ovaries, parovarian, head of pancreas, etc.).

Moynihan classifies them as

- (1) Serous cysts.
- (2) Chyle cysts.
- (3) Hydatid cysts.
- (4) Blood cysts.
- (5) Dermoid cysts.
- (6) Cystic malignant disease.

He gives examples under each heading.

We thus see that there has not been a uniformity in classification, and there has been little effort to explain the origin of these cysts.

The following case, which was presented before the New York Surgical Society, had a cyst which adds something to our knowledge of the subject, and suggests, together with the other reported cases, that many of these cysts originated as embryonic sequestrations.

#### MULTILOCULAR CYST-ADENOMA, IN TRANSVERSE MESOCOLON, CONTAINING PSEUDOMUCIN.

*History of Patient and Description of Operation.*—General Memorial Hospital. (History, No. 6633.) She is forty-one



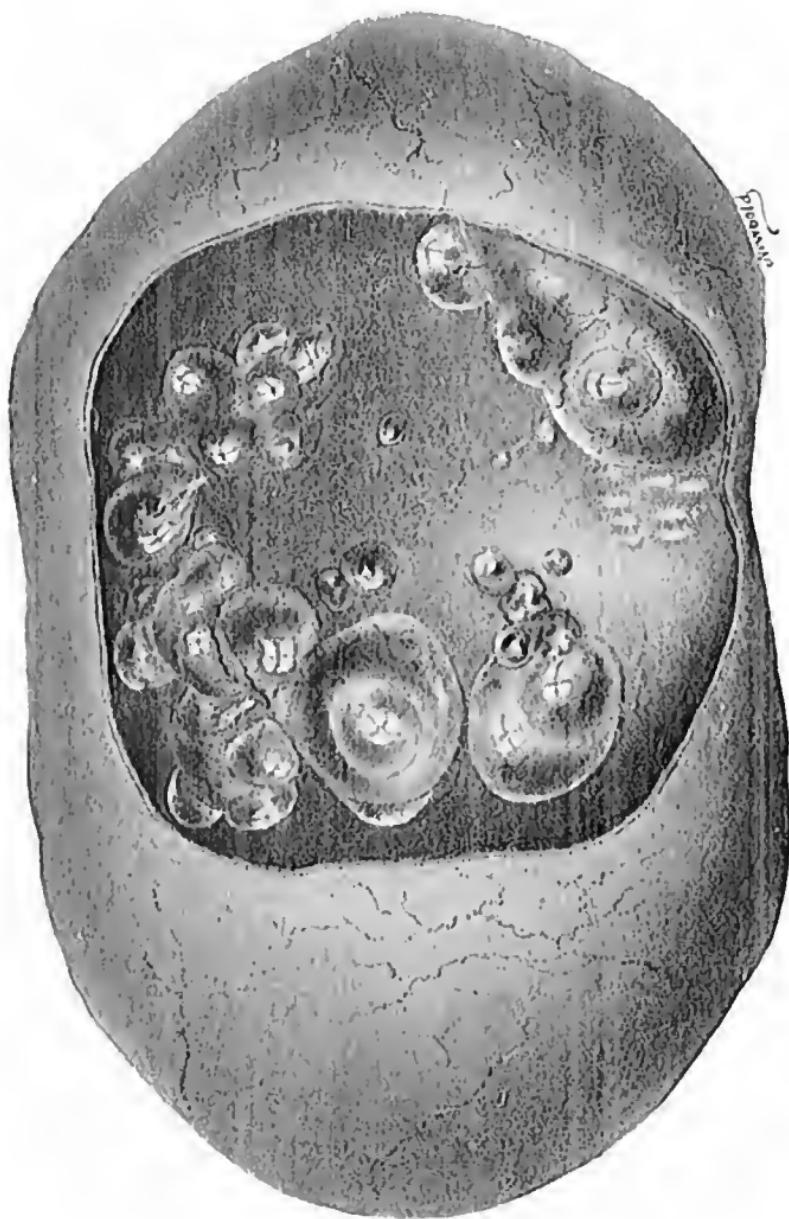


FIG. 1.—Multilocular cystadenoma removed from the transverse mesocolon.

years of age, a native of Switzerland, of good family history, of good constitution, and good previous health. She was married twenty-three years ago, had one child twelve years ago, and has been a widow for ten years. Her menstrual history has been normal, excepting the associated gastric disturbance described below. About eight years ago she noticed tenderness in the left hypochondrium and felt a small lump there. She also had indefinite epigastric pain and occasional vomiting, which usually lasted almost the entire day before menstruation. About five months ago she noticed that the lump had greatly increased in size, and since then it has grown somewhat.

*Present Examination.*—Patient shows nothing abnormal excepting in the abdomen, where there is a tumor which seems to fill the greater part of the abdominal cavity, pressing into the pelvis; it is globular in shape, gives dulness on percussion, and is surrounded on each side by tympanitic resonance, which does not change as she changes her position. There is indistinct fluctuation wave on palpation. After she had worn loose clothing in the hospital for a few days, the tumor no longer pushed into the pelvis, but seemed located in the upper part of the abdominal cavity, and tympanitic resonance existed between it and the pelvis; the uterus and ovaries seemed normal.

Operation was done November 25, 1899. A median incision was made from just below the ensiform cartilage to two inches below the umbilicus. The cyst lay between the stomach and the transverse colon, which it had pushed downward. It was covered by the upper part of the great omentum (the gastrocolic ligament), and an incision was made through this. The various abdominal organs were then examined through this incision; the spleen, both kidneys, the stomach, the liver, the gall-bladder, the uterus and ovaries, were all palpated and found normal. The pancreas was in close apposition to the base of the cyst. The cyst was then tapped and about a litre and a half of viscid fluid withdrawn. It was then drawn through the abdominal incision; it was very vascular; one of the arteries was about the size of the popliteal, and one of the veins about as large as the femoral. No capsule could be separated from its anterior surface, but by drawing it forward and downward until the pancreas came into view a place was found where the peritoneum, which constituted the capsule, could be separated from the rest of the cyst

wall. This separation was then carried on, the vessels being clamped and ligated as they appeared, until the cyst was removed from the abdominal cavity. The extent of capsule which was thus cut must have been ten or twelve inches; after careful examination this was allowed to retract into the abdominal cavity. Although the pancreas was attached to the cyst, there was no pancreatic tissue incorporated in the cyst wall. The cyst was



FIG. 2.—Section from wall of small cyst, showing epithelial covering on both sides of the thin fibrous wall.

situated in the transverse mesocolon, and was not a pancreatic cyst.

The patient made a prompt recovery without incident.

*Description of the Cyst and its Fluid.*—The cyst was found to be globular in form; it contained more than three litres of chocolate-colored viscid fluid; it had a firm wall about two millimetres in thickness. It was covered with peritoneum, ex-

cepting a small area which had been in apposition with the pancreas. On opening it several secondary cysts were found growing from its inner wall and projecting into its cavity. Their appearance is well indicated in Fig. 1. In diameter they vary from one to ten centimetres; their walls were thin and translucent and very vascular, and most of them were filled with clear fluid. In two of them haemorrhages had taken place, and the fluid was accordingly dark in color. The delicate structure of these secondary cysts gave particularly good opportunity for studying their microscopical structure (see Fig. 2). There was a layer of epithelial columnar cells on both outer and inner walls, and a layer of thin fibrous tissue between them which constituted the fibrous portion of the cyst wall. The epithelial cells were large and columnar, like those of mucous membrane.

The wall of the main cyst was composed of dense fibrous tissue (see Fig. 3) containing a few small cells and spaces which represent blood or lymph vessels. On its inner surface there were indistinct small cells, irregularly arranged, apparently the compressed remnant of the epithelial layer shown on the walls of the secondary cysts.

The entire structure was exactly similar to that of a cystadenoma of the ovary; in fact, as one of the demonstrators of pathology said, "The specimen could be used for class-room demonstration of the structure of ovarian cyst-adenoma, and no one could say that it was not such a cyst."

The examination of the fluid from the cyst showed the presence of pseudomucin in large amount. The fluid was of a specific gravity 1010; it was slightly alkaline, somewhat viscid in consistency. That from the clear cysts showed no trace of albumen on the application of heat and nitric acid; that from the cysts where haemorrhages had taken place showed only the faintest trace of albumen, no more than could be expected from the amount of blood present. Microscopically the fluid showed blood-corpuscles, cholesterol crystals, and large granular cells.

Dr. Phoebe A. Levene, who made the chemical analysis of the fluid, stated that the pseudomucin was exactly like that which is found in ovarian cysts. "The material from colloid degeneration is very closely allied to pseudomucin, differing from it by being insoluble in water. This colloid degeneration may occur in various forms of cystic sarcomatous (or carcinomatous) de-

generation. The pseudomucin in this cyst was soluble in water and corresponded exactly to that found in ovarian cysts."

Kelly<sup>28</sup> gives a very concise statement of the relation of pseudomucin to ovarian cysts, from which I quote: "Pseudo-



FIG. 3.—Section of wall of main cyst, showing the dense fibrous structure without distinct epithelial cells.

mucin is one of the most important of the constituents of the glandular ovarian cystomata, and is almost characteristic. It is particularly abundant in cysts containing the tough, sticky,

mucilaginous substance often capable of being drawn out in long threads." "It is also to Pfannenstiel's credit (*Arch. für Gyn.*, Band xxxviii, 1890, page 407) that he has shown that pseudomucin does not result from a colloid degeneration of the cells as supposed, but that it is a real secretion of the epithelial cells which goes on indefinitely without cell destruction. The various stages through which the cells pass in the formation and excretion of pseudomucin may be beautifully seen in a single cyst."

"Pseudomucin is never found in normal ovaries, dropsical Graafian follicles, or in parovarian cysts; it is found in some forms of papillary cysts, and is, as stated, the constant characteristic element in the classical glandular ovarian tumors."

In its relation to other mesenteric cysts, the cyst here described is remarkable in the following particulars:

(1) It shows the exact structures and fluid contents of an ovarian cyst-adenoma; and hence suggests its probable origin from an embryonic ovarian sequestration.

(2) It shows in the smaller loculi the epithelial structure which explains its growth, and in the main cyst wall the firm fibrous structure which has been found in most mesenteric cysts.

(3) It contained clear fluid in some of its loculi and bloody fluid in others, and showed large blood-vessels in the delicate cyst walls, thus indicating that haemorrhages from the cyst walls explained the sanguineous fluid, and suggesting a similar cause in other sanguineous cysts.

#### EVIDENCES THAT THE CYST WAS OF EMBRYONIC ORIGIN.

—The occurrence of this cyst in the transverse mesocolon is most suggestive, and leads to inquiry as to its origin. It could not be an ovarian cyst which had become separated from the ovary by twisting of its pedicle, because such a cyst could never have migrated to that locality; it could not have gone through the peritoneum and pushed between the layers of the mesocolon. Furthermore, the ovaries were found of normal size and in normal position. If, however, a portion of the ovary or of the germinal epithelium had been separated from

the rest of the organ in the early process of development, it could easily have reached this location.

The diagram which is here given shows the embryonic genito-urinary organs.

Morris states: "The earliest appearance is that of a tube called the Wolffian duct, which opens by its hinder extremity into the cloaca or common outlet for the intestinal and urinary passages. From the forepart of this duct is developed a tem-

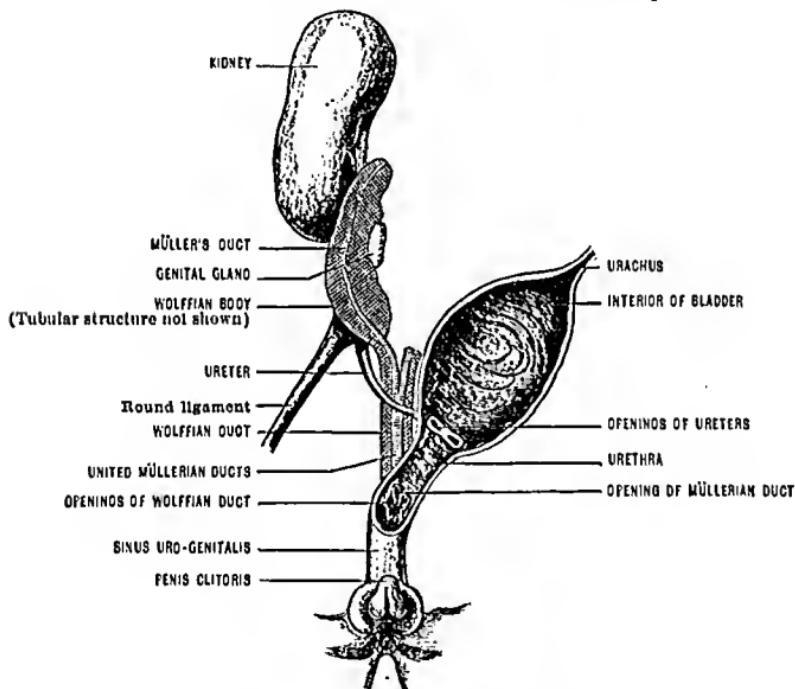


FIG. 4.—Diagram of the primitive genito-urinary organs before differentiation of sex (after Henle), from Morris's "Human Anatomy." Blakiston's Son & Co., p. 1055.

porary organ, the pronephros or head-kidney; from the mid-part is developed the mesonephros, or Wolffian body; from the posterior end of the duct springs the metanephros, from which the kidney is developed. The genital gland arises as a ridge, partly mesoblastic and partly due to a thickening of an epithelial layer; the germinal epithelium is on the inner side of the Wolffian body."

Thus we note that the organ from which the ovary and the parovarian come is in embryonic life close to the kidney.

Now, if we study the primitive alimentary canal (Fig. 5), we see how easily a sequestration from the Wolffian body, or the embryonic genital gland, could be included between the folds of the mesentery.

"The alimentary canal first appears as a simple tube lying about the median line in front of the posterior abdominal parietes and placed vertically. This tube is connected with the posterior parietes by a simple fold of peritoneum, a species of general mesentery."

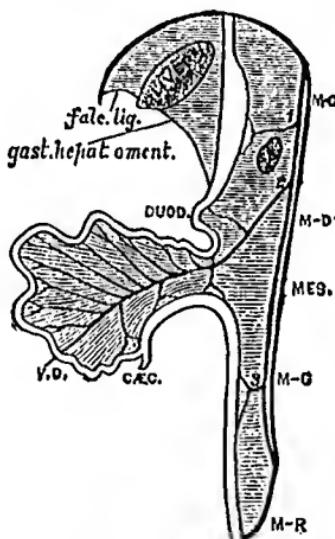


FIG. 5.—Diagram of the primitive alimentary canal, from Morris's "Human Anatomy." Blakiston's Son & Co., p. 993. M. G., mesogaster; M. D., mesoduodenum; Mes., mesentery; M. C., mesocolon; M. R., mesorectum; 1, 2, 3, arteries.

As the alimentary canal becomes differentiated, this "general mesentery" develops with it. The great omentum is formed from the mesogaster and a part of the transverse mesocolon, and the mesoduodenum, mesentery, mesoileon, and mesorectum develop with the growth of the part to which they are attached; thus affording opportunity for the inclusion of an

embryonic structure, if it were present. Moynihan<sup>6</sup> states congenital remnants of the Müllerian and Wolffian ducts and bodies are regularly found between the layers of the mesentery; and of the vitelline duct in close relation to the diverticulum of Meekel.

*Instances of Sequestration from Various Organs.*—In the growth of the various organs of the body, fragments are occasionally separated from the main part of the organ, and are found in the tissues in localities more or less remote.

For instance, accessory lobules about the thyroid gland have been frequently observed,<sup>30</sup> situated sometimes on the hyoid bone, on the deep portions of the trachea, in the supra-clavicular region, in the larynx, on the aorta, and even behind the pharynx.

Accessory thymus glands are not uncommon,<sup>30</sup> they usually lie above the main gland in the vicinity of the thyroid.

Accessory lobules about the breasts have been often described. Williamis<sup>31</sup> states that the connection of these outlying processes with the corpus mammae is often reduced to a narrow pedicle, and not infrequently by its rupture they become completely sequestered. These sequestrations gave rise to neoplasms identical in structure to mammary neoplasms.

Delafield and Prudden<sup>32</sup> call attention to little rounded nodules, loosely attached to the suprarenal capsule, which have the same structure as the capsules themselves. Rests or sequestrations from the suprarenal capsules have frequently been found within the kidney.

Accessory spleens are not uncommon.<sup>33</sup> The most common situation is in the gastrosplenic ligament. Rokitansky and Klob have each found such an accessory spleen in the head of the pancreas. Double spleens and spleens with deep clefts in them are also described.

An accessory pancreas is occasionally found. It is usually flat, from the size of a lentil to that of a silver dollar, made up of glandular nodules and situated in the wall of the upper part of the duodenum or the stomach; more rarely in the lower part of the duodenum, and sometimes under the serosa; sometimes

in the muscularis and submucosa. The structure corresponds with the pancreas itself, and there is a small duct communicating with the intestine.<sup>30</sup>

Accessory lobes of the lung are also found.<sup>34</sup> Rokitansky has described one which was separated from the normal lung and its bronchi, and which lay between the lower left lobe and the diaphragm. C. W. Collins explains a supernumerary apex lobule by a former adhesion of the lung to the chest wall, so that the vena azygos could not go behind the lung during the descent of the heart, but cut off the adherent piece from the rest of the lung.

Small isolated parts of the liver, which are fastened to the liver by fibrous bands, have been described.<sup>35</sup> E. Wagner has recorded the development of liver tissue in the ligamentum suspensorium.

Cases of true supernumerary kidneys have been described<sup>36</sup> by Blasius (two left kidneys) and Hyrtl (a third kidney in front of the left iliac synchondrosis), besides the two kidneys in their normal positions. Double ureters are relatively frequent. Such a specimen was recently presented to the New York Pathological Society by Dr. Ely;<sup>37</sup> another by Dr. Philips,<sup>38</sup> and others were described by Dr. Biggs.

The placenta succenturiatae, which, according to Winkel,<sup>39</sup> are found in 1 to 2 per cent. of all cases, are examples of similar sequestrations.

The various dermoids which are found beneath the skin are due to a separation of the skin elements which result from faulty development.

Supernumerary ovaries have been observed in many cases<sup>40</sup> (Grohe, Klebs, De Sinty, Winkel, Olshausen); the multiplicity being due either to spontaneous subdivision of the embryonic rudiment of the organ, or to mechanical abstraction of one or more portions of it.

This separation of portions of developing organs from the main organ is so common that it need not occasion surprise. The tendency to abnormal development in parts derived from the Wolffian body and the germinal epithelium is further shown

in the frequency of parovarian cysts, ovarian cysts, and cysts of Grtner's ducts. The congenital cystic kidney is believed by some pathologists<sup>40</sup> to be caused by the inclusion of certain parts of the Wolffian body within the kidney itself.

*It is altogether within the bounds of probability that such a separation should from time to time take place from the Wolffian body or the germinal epithelium at an early time in embryonic life; and, if such portions are separated, it is not strange that they should be carried into the mesentery, mesocolon, or mesorectum in the course of their development, and there form cysts such as this one or like many of the others which have been described; or, if they should not be carried into the mesentery, they might develop as retroperitoneal cysts, some of which are certainly similar in structure to the mesenteric cysts; or, if they should be carried into that portion which forms the great omentum, they would form omental cysts, which are also of similar structure.*

The indications that this particular cyst is embryonic, and that it was due to the development of an ovarian rest in the mesocolon, are enough to amount almost to a proof; for we have the structure and fluid contents of the cyst, which are exactly similar to those of ovarian cysts; the location which is close to that from which the developing ovary migrated, and the fact that sequestrations or rests from the various organs of the body are of common occurrence.

**CONSIDERATIONS WITH REGARD TO THE ORIGIN OF OTHER CYSTS.**—After studying the etiology of this cyst, the question naturally arises, How many of the other mesenteric cysts are of embryonic origin?

We are unable to find the record of any other which corresponds exactly to this. A multilocular mesenteric cyst with columnar epithelium on the smaller cyst walls, an absence of epithelium on the main cyst wall, and pseudomucin in the fluid, have not been recorded as far as I know; although the records indicate that such cysts have been observed, but not described in detail.

In the process of cyst building, as shown in ovarian and

parovarian cysts, the fluid comes from three sources:<sup>28</sup> (1) The secretion from the epithelial cells. (2) The transudation from the blood-vessels. (3) The destruction of the cells.

As the process goes on the epithelium is modified and often destroyed. Sutton<sup>41</sup> states, with regard to parovarian cysts, that "when small they are lined with columnar epithelium which is ciliated in some specimens. In large cysts it becomes stratified and in very big cysts it atrophies." Hence, it is altogether probable that many of the mesenteric cysts with fibrous walls and no epithelial lining have at one time been lined with epithelium. There are records of many such cysts which correspond to the description of ovarian and parovarian cysts, and there is a strong probability that they are really of embryonic origin. The rarity of an epithelial lining in mesenteric cysts led Hahn<sup>3</sup> to state that they were without such lining; but Macdonald,<sup>43</sup> Küster,<sup>49</sup> and Studgaard<sup>50</sup> have described cysts with epithelial lining; and Pagenstecher<sup>21</sup> has found epithelial cells in fluid.

Of the cysts which seem similar to the author's, we may mention Macdonald's,<sup>43</sup> a cyst which had first appeared in the upper part of the abdomen and then grown downward. It was adherent to surrounding structures, was apparently situated in the mesentery, and was attached to the spinal column just in front of the aorta and vena cava. It consisted of a main cyst and smaller cysts in its wall. Both the primary and secondary cysts were lined with columnar epithelium "exactly resembling that of an ordinary proliferous ovarian cyst."

The cyst wall was composed of a "loose fibrous network with but few cells, except ordinary connective-tissue corpuscles."

Morton<sup>44</sup> also describes a mesenteric cyst which resembles this in many particulars. "The cyst had a dense white wall of fibrous tissue, and on laying it open there were seen some soft partitions of what looked like fibrin stretched across it. On the interior of the wall at one spot there was a vesicle such as one might see on the skin after the application of an irritant. The fluid was slightly blood-stained, a little viscid, and on standing in the enamelled vessel for an hour spontaneously coagulated into a soft jelly. The wall resembled more that of a miniature ovarian

cyst than any other kind. Microscopic examination of it only showed dense fibrous tissue."

Löhlein<sup>51</sup> describes a cyst which extended back to the spine and down into the pelvis, which compressed the ascending and transverse colon, which had a fibrous wall, and which contained thin, yellow, mucous-like fluid, which in parts was flaky and gelatinous.

Bantock<sup>52</sup> describes a cyst covered by mesentery, which lay in close contact with the kidney, and which contained a glairy mucoid fluid. The cyst was composed of a number of intercommunicated loculi, separated by numerous septa.

Pean<sup>53</sup> reports a large multilocular cyst, extending from under the mesorectum, which contained serous, clear brown, transparent fluid.

Carter<sup>54</sup> records a thin-walled cyst which was very vascular, which was attached to the side of the spine in the left lumbar region, and which contained sixteen pints of thin, clear, slightly opalescent fluid, alkaline; specific gravity 1009; no albumen; large amount of chlorides. No record of examination of cyst wall.

These cases are all enough like the one here reported to make it highly probable that they are of similar origin.

If, now, we take the groups given in the classifications of Hahn, Broquehaye, and Moynihan and examine them in detail, we find indications that very many of them were of embryonic origin.

These classifications include the following groups: (1) Dermoid cysts; (2) Chylous cysts; (3) Sanguineous cysts; (4) Serous cysts; (5) Hydatid cysts; (6) Cysts of adjoining organs; (7) Cystic malignant disease.

*Dermoid Cysts.*—Dermoid cysts are believed always to be due to an error in development in the ovary or some one of the epithelial structures. They occur chiefly in the abdomen and in places where skin-covered surfaces coalesce during embryonic life, such as the orbital region, the naso-facial sulcus, and along the median line of the body. When in the abdomen they are believed to be of ovarian origin; Cohnheim attributes their origin to inclusion of a part of the ectoderm in the ovary

in early foetal life and the growth of these elements at a later time. In certain instances they are believed to be due to a blighted ovum which has been included in an otherwise healthy embryo. Those which occur in other places than the abdomen are believed to be due to the inclusion of portions of the skin, or, in some instances of mesoderm or even endoderm, beneath the line of coalescence and corresponding growth at a later time. Teeth are rare, excepting in ovarian dermoids; but they do occur in rare instances in other localities. Mandelbaum<sup>42</sup> refers to such instances in dermoids of the mediastinum, a form which is believed<sup>40</sup> to be due to an inclusion of embryonic elements beneath the surface at the sternal coalescence of the two lateral portions of the body.

There have been records of several mesenteric dermoids. Schutze<sup>55</sup> records one in which two canines, two incisors, and eight molars were present.

Mayer<sup>12</sup> describes a dermoid larger than a man's head which was taken from the mesentery; it was free from the genitals. The inner cyst wall was smooth and shiny and beset with long black hair; the fluid was yellowish-brown, similar to pea soup. Spencer Wells<sup>56</sup> removed from between the folds of the mesentery one which contained bundles of fine hair and six pounds of fatty material and flattened epithelium. Langton<sup>57</sup> removed a dermoid from between the layers of the mesentery, and another from each ovary. König<sup>58</sup> states that he has observed a dermoid cyst in the mesentery.<sup>1</sup>

These cysts are all believed to be of embryonic origin, and I know of no other theory which explains their formation.

*Chylous Cysts.*—Chylous cysts have been described in large numbers; they are more common than any other variety of mesenteric cysts. The fluid has usually been described as milk-like, or chylous. That from a case described by Carson was cream-white, specific gravity 1014, alkaline, contained albumen, but no fibrin; microscopically there were large

<sup>1</sup> Lexer, in an article which has been published while this paper was in the printer's hands, refers to several additional mesenteric cysts; he also believes that some of them were due to ectodermic rests from the Wolfian duct. *Archiv f. klin. Chir.*, Ixi, p. 648.

granular cells, in some of which the protoplasm had undergone fatty degeneration; there were fat globules and crystals of sodium chloride, also carbonates chlorates, and sulphates. The walls of the cysts are usually fibrous and firm. It has been generally supposed that these cysts are due to a dilatation of some one of the lacteal or the chyliferous vessels, as taught by Rokitansky half a century ago. It has also been suggested that there has been effusion of chyle into previously existing cysts; this seems much more probable. We can see how a duct which has a gland behind it might become cystic if it were occluded; the size of the cyst depending upon the extent to which the pressure of the cyst fluid could distend its wall. It is not easy to understand how this process could take place in vessels so rich in anastomoses as are the chyle vessels. There are records of at least ten cases where the thoracic duct, or one of its main branches, has been wounded and either sutured, ligated, or packed, without evidence of cyst formation.<sup>46 47</sup> Ziegler<sup>80</sup> states that occlusion of the thoracic duct may be followed by anastomosis, or by distention of the lymph vessels, and mentions the distention of the lacteals into elongated tortuous forms in certain instances where they have been obstructed.

One cannot deny the possibility of cyst formation by this process, but it is unlikely and at variance with ordinary pathological processes. It seems far more likely that chyle should be effused into the cavity of cysts already formed, particularly as lymph nodes have been found in the walls of mesenteric cysts,<sup>62 48 21</sup> thus indicating the presence of lymphatic structures; and spaces are seen in the cyst walls which are apparently lymph channels.

In chylous ascites we have an example of the effusion of chyle, and in chyluria we have a condition which is in some respects similar. In the ordinary process of cyst formation, it is believed that serum transudes from the blood-vessels into the cyst cavity; and in the author's specimen and many others we have examples of extravasation of blood into the cyst fluid. In the case of Ducasset<sup>50</sup> there was a multilocular cyst in which some loculi contained yellow serous fluid, with no evi-

dence of chyle, and others contained white chylous fluid. In Demon's<sup>60</sup> case of multilocular cyst one loculus contained blood and the others chylous liquid. In Raseh's<sup>61</sup> case, where the cyst wall was sewed to the abdominal wall, there was an oozing of chylous fluid for a short time after the cyst had been emptied. Küster<sup>40</sup> describes a chylous cyst which was lined with epithelium, a lining which would not have existed in a dilated lymph vessel; and Pagenstecher<sup>21</sup> has described one, in the fluid of which there were degenerated flat epithelial cells.

Taking these cases together, it seems pretty well established that the chylous cysts are really preformed cysts, situated in such close relation to the lacteals that chyle has been effused into them and that they are really of embryonic origin, in structure similar to ovarian and parovarian cysts.

*Sanguineous or Blood Cysts.*—The cysts which have been described as sanguineous or blood cysts have usually contained bloody fluid similar to that in the author's case.

Morton's<sup>44</sup> cyst, for instance, which is referred to above, has been described as a blood cyst, although the fluid is only "slightly blood-stained." Hahn<sup>8</sup> describes one which contained 400 centimetres of thin brownish-red fluid. The wall was four millimetres thick, smooth, and shiny on the outer side; from the inner side there were vessels hanging in the cyst cavity, which were evidently the remnants of previously existing septa. These were apparently preformed cysts into which haemorrhage had taken place. The vessels in the cyst walls are so abundant and so delicate that one can easily understand the occurrence of this haemorrhage; and the presence of clear fluid in some loculi and blood-stained fluid in adjoining ones indicates the steps of the process.

There have also been haematomata in the mesentery; but the tendency of haematomata here, as elsewhere, seems to be towards absorption and not towards the formation of cysts with walls of definite structure, such as are found in the mesentery.

Fisher<sup>63</sup> has written at length on peritoneal sanguineous

cysts, but all of his cases seem to be haematomata of comparative short duration, or previously existing cysts into which haemorrhage had taken place.

It would seem that the cysts with bloody fluid should be classified according to the structure of their walls and the chemical character of the fluid, and that the haematomata should be considered simply as haematomata, and that the classification blood cysts need not be used unless further observations should make it desirable.

*Cysts with the Walls which suggest Intestinal Structure.*—There is a variety of cyst not mentioned in the classifications above given which may be naturally considered at this point. Cysts with muscular fibres or other elements so arranged as to suggest the structure of the intestine.

The most remarkable one was recorded by Studgaard,<sup>50</sup> who gives a very careful description and good pictures. It was in the mesentery, contained 200 cubic centimetres of chocolate-colored fluid, and had a funnel-like process, or pedicle, thick as one's thumb, which had to be severed in removing the cyst, the cut extending through the different layers of the cyst wall. The inner surface of the sac was in parts smooth and shiny, another part had the appearance of mucous membrane, and section through this showed a layer of tubular glands tightly packed together, with a membrana propria, a single layer of cylindrical epithelial cells and a perceptible lumen; beneath this layer there was a muscularis mucosa, then a submucous layer of connective tissue, then a layer two millimetres in thickness composed of smooth muscle fibres running parallel with the circumference of the aperture in the cyst wall; and outside of this another layer—half as thick—composed of smooth muscle fibres running at right angles with those of the first layer, then connective tissue and serosa. "The cyst wall was therefore in perfect agreement as to structure with the wall of the intestine, save that in the latter we do not find an irregular hypertrophy of the tubular glands with degeneration of the superficial layer which was shown here; nor were Peyer's patches or solitary glands shown." On the smooth portion of the cyst wall this layer of villous mucous membrane was represented by a connective-tissue layer contain-

ing pigment and epithelial cells irregular in formation and arrangement. The situation in the mesentery is not given.

Eve<sup>10</sup> has described a cyst removed from the mesentery of the jejunum which had in its wall three layers of unstriped muscle fibres. The section showed the middle layer cut transversely and the other two longitudinally. He refers to specimens in Museum of Royal College of Surgeons, No. 2352 E, from girl of nine, which had a considerable quantity of unstriped muscle tissue in its walls.

Fehleisen<sup>11</sup> has also described a multilocular cyst which contained 8200 cubic centimetres clear reddish-brown fluid, and had unstriped muscle fibres in the cyst walls. The walls contained three layers: (1) outer, dense connective tissue; (2) median, very vascular connective tissue, loosely arranged; (3) internal layer exclusively unstriped muscle fibres, arranged longitudinally but with large bundles having a more or less irregular construction. "The muscle fibres were characteristic; they differed in no respect from those found in intestinal tract or bladder."

Brentano<sup>22</sup> also describes a mesenteric cyst in the wall of which there were smooth muscle fibres under the serosa. The fluid contained fibrin and degenerated blood-cells.

Unstriped muscle fibres may sometimes be demonstrated in the wall of ovarian cysts, but not in such large amount or in such definite layers as those here recorded. The natural explanation of Studgaard's case is that it was due to a sequestration or diverticulum from the intestine. This definite intestinal structure could hardly have come from any other source, and a part or all of the other cases are apparently of similar origin, but less perfectly developed.

*Serous Cysts.*—Serous cysts have been referred to by many observers, but it is very difficult to find descriptions which show us just where to classify them.

The following three cuts (Figs. 6, 7, and 8) are taken from Moynihan's article published in the ANNALS OF SURGERY, July, 1897, Vol. xxxi, page 1.

The fluid in each of these cysts was pale, clear, straw-colored, specific gravity 1015-1016, alkaline, and contained a large amount of albumen.

No description of the eyst walls is given. The wall of the next cyst described, which was similar, was, however, referred to as white and fibrous.

Braithwaite<sup>20</sup> removed a cyst from the great omentum which contained three and one-half pints of clear watery fluid, and described the wall as thin and of the bluish color seen in an ordinary ovarian eyst.

Jessett<sup>21</sup> describes a multilocular eyst of the great omentum

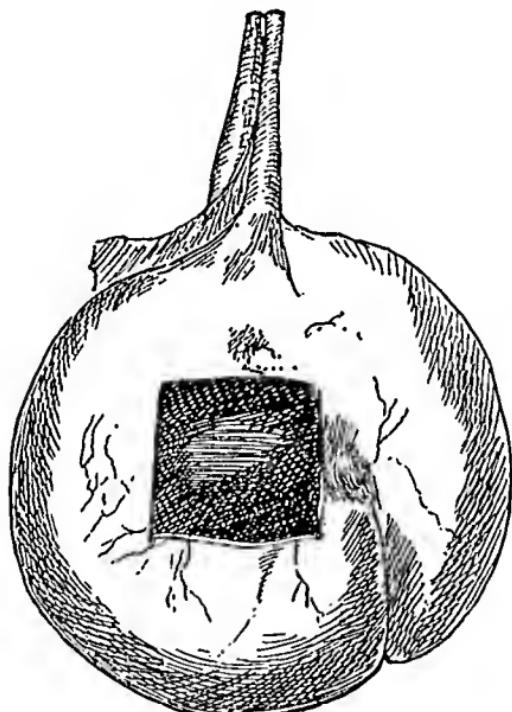


FIG. 6.—Unilocular cyst of the mesentery. Normal size.

which contained serous fluid, but does not describe the eyst wall. He refers to five similar cases recorded by other observers.

Eve<sup>19</sup> gives a very careful description of two cysts which occurred in young children, one eleven weeks and the other three and two-thirds years of age.

The fluid in the first was turbid serum, containing white and red blood-corpuscles but no fatty corpuscles;  $\frac{5}{120}$  of albumen; the walls were three lines in thickness and showed no endo- or

epithelial lining, but contained three layers of unstriped muscle fibres (as previously described).

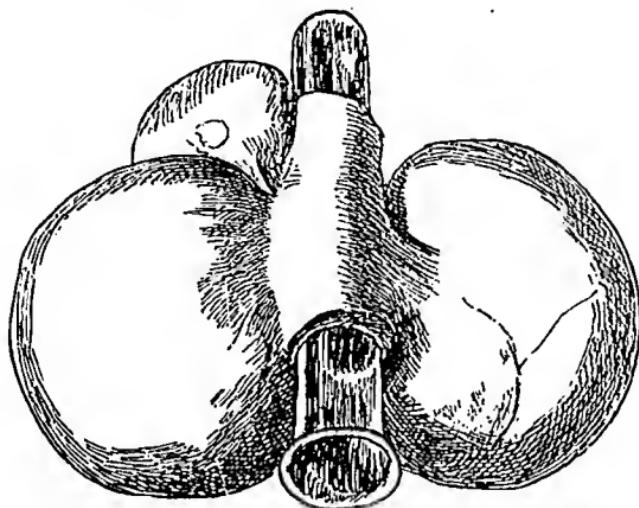


FIG. 7.—Multilocular cyst of the mesentery. One-third natural size.

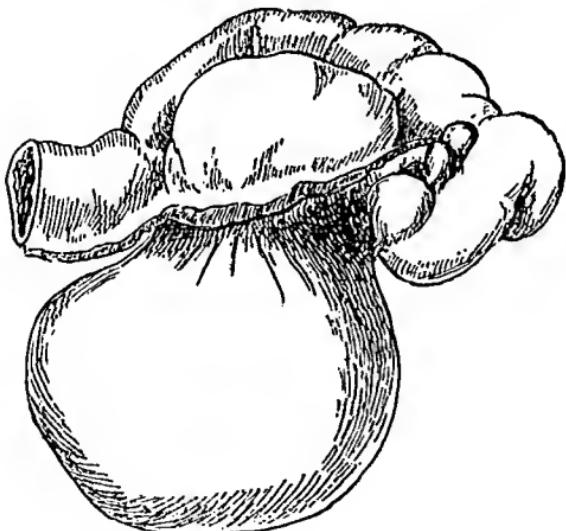


FIG. 8.—Multilocular cyst of the mesentery. One-half natural size.

The cyst in the second case contained thirty-two ounces of clear, straw-colored serum, which became solid on boiling, and

contained a large quantity of cholesterin but no fatty matter. It was seven feet above the ileoçæcal valve, between the layers of the mesentery; the walls were extremely thin, their under surface smooth. Under the microscope there was no lining shown; "the inner half was composed of connective tissue, containing granulation cells, and the outer half of loose connective tissue and fat. No unstriped muscle tissue."

Frentzel<sup>65</sup> records a mesenteric cyst, treated by Luecke, which had smooth, shiny walls, and contained 100 cubic centimetres of brown serous fluid, in which yellow "granular cells like those of an ovarian cyst" were found. (V. Recklenhausen.)

Obalinski<sup>66</sup> has contributed an article on serous retroperitoneal cysts, and described such a cyst which contained three litres of clear watery fluid, with 12 per cent. of albumen and chlorides and traces of earthy phosphates. The wall was one millimetre thick and composed of firm connective and elastic tissue. He also refers to an article by Przewski, in which other similar cases are reported, and the origin from the Wolffian body or Müllerian duct suggested.

So far as these cases are described, they correspond closely to those forms of ovarian and parovarian which contain serum, the fibrous wall and the serous fluid being the elements upon which this similarity rests. They can with propriety be considered as of probable embryonic origin; they bear a close resemblance to the other cysts which we have considered. Whether the fluid is exuded from blood-vessels in the form of serum, or whether it is secreted from the cells which line the cyst, seems to be largely dependent upon the structure of the cyst wall, and the close resemblance between these serous cysts and serous cysts of the ovary and parovary is very suggestive.

Gairdner,<sup>67</sup> nearly fifty years ago, described a remarkable serous cyst of the omentum which I have not included among the epithelial lined cysts, since it is not easy to interpret the microscopical reports of that time. It should surely be referred to, however.

The cyst was in the great omentum, between three and four feet in length, one-half to one and one-half inches in breadth,

having a lobulated appearance like a distended colon, but no complete septa. Sac highly transparent, vascular.

Fluid transparent, colorless; serum, containing numerous flocculi, which microscopically showed the ordinary filamentous appearance of fibrinous or albuminous matter, entangling various nuclei and imperfect forms of epithelium evidently detached from inner wall of cyst.

"Nor did the examination of the interior of the cyst membrane (so far as it could be pursued without altogether spoiling the preparation) reveal any more organized structure than that of an epithelial membrane."

It is worthy of note that most of the serous cysts occur in the omentum, intestinal edge of the mesentery, mesocolon, or retroperitoneal region, while the cysts which occur in the mesentery, excepting at the intestinal border, usually contain chyle. Heinrichs<sup>16</sup> has reported a case which is an exception to those previously described in that it has endothelial cells on both the outer and inner surfaces of its walls. It was in the ascending mesocolon and contained four litres of clear, watery, albuminous fluid. Photographs of the cyst and microscopical drawings of the cyst wall are given. It is to be expected that future cases will throw light upon this one.

*Hydatid Cysts.*—Hydatid mesenteric cysts form a class by themselves, and are due to a specific cause, the growth of the *Taenia echinococcus*. Nannotti<sup>13</sup> has written a most comprehensive article on hydatids of the mesentery, and has collected twenty-nine cases, sixteen of which were described as anatomical and were examined post-mortem; thirteen were described as clinical. Several of the cases had hydatids elsewhere.

In making the diagnosis of hydatid cysts, the hooklets or the peculiar laminated structure of the cyst wall should be found. Cases have been described as barren hydatids in which no hooklets were found, and in which there was no record of the characteristic cyst wall. The diagnosis was made on the character of the fluid, which was of a specific gravity of 1010 or less, contained no albumen, but abundant chloride. Fluid

of this nature is not diagnostic of a barren hydatid, as is shown by the case which the writer reports. It is not impossible that some of the cases which were so reported were really embryonic cysts which contained pseudomucin.

*Cysts of Organs adjoining the Mesentery* sometimes push themselves between the mesenteric folds, a process, for instance, which might take place with a pancreatic cyst. It seems better, however, to consider such cysts under the heading of the organ from which they grow.

*Cystic Malignant Disease* does not often occur in the mesentery, so that the cyst greatly exceeds the solid part of the tumor. Keen,<sup>27</sup> however, has reported a cystic sarcoma of the omentum in which the fluid weighed ten pounds.

**DIAGNOSIS, PROGNOSIS, AND TREATMENT.**—These elements have been carefully considered by other writers, and this paper has already exceeded its expected length. In most instances the cyst is movable, giving an area of tympanitic resonance on all sides, and it is not connected with the pelvic organs. The symptoms are mostly those which come from the mechanical pressure of the tumor; there is usually pain; there is often constipation and vomiting; and there is sometimes emaciation, which is believed to come from interference with the chylous circulation.

These tumors, as a class, are among the serious abdominal lesions, but many of them are so situated as to be removed without difficulty. The treatment, unless there are some strong contraindications, would be exploratory incision, removal of the cyst if practicable, sewing it into the abdominal wound, and draining it if removal is not practicable. Aspiration is to be avoided.

Jesseyt<sup>24</sup> has successfully enucleated a cyst and resected a piece of intestine which was included in its wall, and united the cut ends of the intestine. This procedure has also been done with solid tumors of the mesentery.

**SUMMARY.**—(1) The occurrence in the transverse mesocolon of a multilocular cyst-adenoma which contained pseudomucin, and which was exactly like a cyst-adenoma of the

ovary, suggests its probable origin as an embryonic ovarian sequestration.

(2) The occurrence of dermoid cysts in a similar position suggests a similar origin.

(3) The occurrence of chylous cysts in the mesentery, which have the structure and appearance of ovarian and paro-varian cysts, and which have in their walls lymph vessels, suggest embryonic cysts into which there has been an effusion of chyle.

(4) The sanguineous cysts appear to be preformed cysts into which haemorrhage has taken place; haematomata in the mesentery should not be described as cysts.

(5) The presence of cysts which have the structure of the intestinal wall suggest sequestration from the intestine.

(6) Serous cysts are apparently similar in origin and structure to the cysts already considered. They are usually not situated in the path of the laeteal vessels.

(7) Hydatid cysts form a class by themselves and are due to the *Tænia echinococcus*.

(8) Reports indicate that mesenteric cysts are being removed at least as often as once a month. If microscopical examinations of the cyst walls and chemical and microscopic examinations of the cyst fluid are made, the entire subject should soon be understood.

(9) It is probable that all mesenteric cysts may be included in the classifications

(1) Embryonic cysts.

(2) Hydatid cysts.

(3) Cystic malignant disease.

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